

# **An Introduction to Dooyeweerd and Aspects**

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**Digital Transformation: A Multi-Aspectual Perspective**

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1. Introducing Herman Dooyeweerd
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  3. Some Notes On Aspects - Some Useful Concepts
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Text has wide margin, for making notes therein.

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"http://dooy.info/papers/aspects-iconf20.pdf"

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## 1. Introducing Herman Dooyeweerd

Herman Dooyeweerd (1894-1977), was a Dutch thinker, initially working in politics research, then became Professor of Jurisprudence at the Free University of Amsterdam in the 1930s (see "<http://dooy.info/hd.html>").

He was perplexed that the various schools of law (that had different ways of understanding what law is) never seemed to talk to each other but kept themselves isolated from, and in competition with, each other. There were proponents of Natural Law, Kantian Law, Positivist Law, and so on.

He discovered a major reason for this, in that each of them was grounded in a different philosophy, and that those philosophies never talked with each other, never really engaged with each other. So he investigated the problems in philosophy to see why, and recognised that each had different starting points, different presuppositions.

(What is the difference between assumptions and presuppositions?

- » An assumption is to do with what is true.
- » A presupposition is to do with what is meaningful.

Example: "I assume it will rain tomorrow" is an assumption. But I presuppose it is possible to rain, so in a desert, the assumption is meaningless. Each philosophy's presuppositions give its starting-points, and determine what it seems relevant to think about.)

Dooyeweerd's philosophy is radically different and wide-ranging. Right at the beginning of his *magnum opus* [Dooyeweerd 1955], he outlined his different presuppositions and starting-points. They differ from conventional philosophies in the following ways:

- » Whereas most philosophies presuppose the validity of theoretical thought, Dooyeweerd questioned this and began with the pre-theoretical outlook that we adopt in **everyday life**.
- » Whereas many philosophies try to reduce the immense **diversity** of what we experience (e.g. to mathematics, physics, evolution, psychology or social construction), Dooyeweerd critically respected it, provisionally delineating fifteen ways in which reality can be meaningful, which he called "aspects".
- » Whereas those philosophies and systems theories that recognise diversity tend to fragmentation, Dooyeweerd presupposed innate "**coherence of meaning**".
- » While many philosophies presuppose autonomy, Dooyeweerd started with **createdness**.
- » Whereas most philosophies have presupposed being or process, Dooyeweerd presupposed **meaningfulness**. From meaningfulness emerges not only being and process, but also rationality value and good. So no longer need we separate "is" from "ought".

All these are relevant to **digital transformation** (as to many other topics), but in this workshop, it is the diversity, respect for everyday experience and meaningfulness on which we will most focus.

## 2. Dooyeweerd's Aspects

As in architecture, an aspect is a way of seeing things that cannot be explained in terms of other aspects. Any thing, event, project or situation exhibits a number of aspects - they are meaningful in a number of ways.

Example, this talk:

A talk is meaningful in terms of communication. But it's also meaningful socially, in that good speakers do not just read text but engage with their audience as human beings like themselves. They will try to give their hearers what is due to them. In this short account we find three aspects: lingual, social and juridical (see below) - and there are others.

Separating out such aspects of any thing, event, project or situation can help us understand it, and especially what went wrong (or right). doing so can help us assess things, and can help us design or plan things - whether a talk or a digital transformation or anything else.

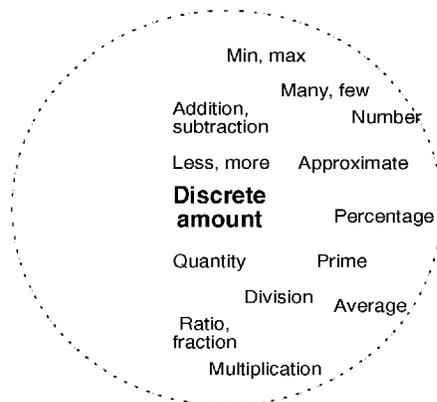
Those are three of the fifteen aspects that Dooyeweerd delineated. Each has a distinct kernel meaningfulness, and is potentially relevant to digital transformation in different ways. The following outlines each of Dooyeweerd's aspects, briefly outlining its kernel meaning, the good it brings into reality (and any dysfunction) and its 'constellation' of meaningfulness around the kernel. It suggests a few examples of how the aspect might be relevant to digital transformation, and offers links to a more complete summary and a fully reflective discussion of each.

What are aspects as such? See section after the outline of each aspect. In the meantime, please read the following intuitively more than logically - and maybe don't read them in order. For a full discussion of aspects, see "<http://dooy.info/aspects.html>".

### The Quantitative Aspect

Kernel: Discrete quantity / amount ("numberness"). Experienced as: One, several and many, and comparisons of less and more; measurement. Good: Reliable amount and sequence.

Example: Amount of transformation (presupposes ability to measure).



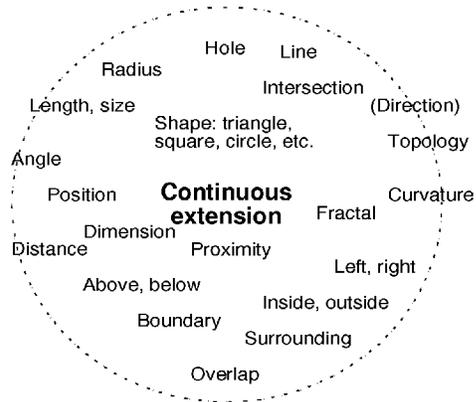
Summary: "<http://dooy.info/aspects.smy.html#qnv>"

Fuller: "<http://dooy.info/quantitative.html>"

## The Spatial Aspect

Kernel: Continuous extension (extendedness). Experienced as: Here, there, between, around, inside and outside, shape, proximity. Good: Simultaneity, continuity.

Example: Geographical extent of transformation.



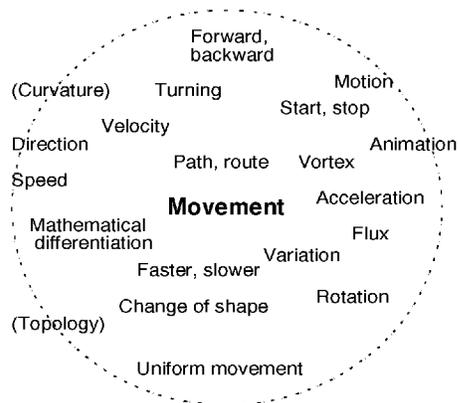
Summary: "<http://dooy.info/aspects.smy.html#spa>"

Fuller: "<http://dooy.info/spatial.html>"

## The Kinematic Aspect

Kernel: Movement. Experienced as: Going and flowing; forward and backward. Good: Dynamic variation.

Example: Flow of data when the digital system is running.



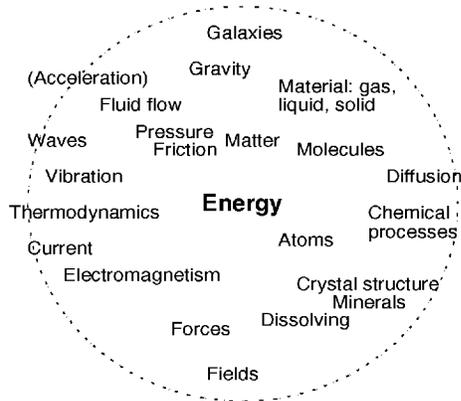
Summary: "<http://dooy.info/aspects.smy.html#kin>"

Fuller: "<http://dooy.info/kinematic.html>"

## The Physical Aspect

Kernel: Energy. Experienced as: Matter, forces, energy, etc. (at microscopic, human and macroscopic spans). Good: Causality, resistance to causal change; momentum, irreversibility.

Example: Power cuts! Also (indirect) impact on planet via pollution or climate change emissions.

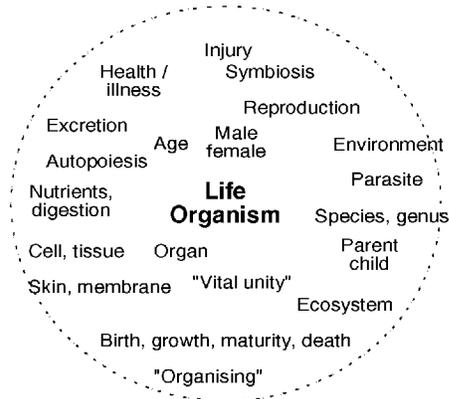


Summary: "<http://dooy.info/aspects.smy.html#phy>"  
 Fuller: "<http://dooy.info/physical.html>"

### The Organic / Biotic Aspect

Kernel: "Vital unity" and "organizing" [NC,II, 110]; often seen as "life functions". Experienced as: Living as organisms in an environment (ecosystem). Good: Autopoietic independence from environment; Dysfunction: Disease.

Example: Two-way impact of the transformation on health of those affected (including indirectly, e.g. communities or populations) and of health on the operation of the transformation. What happens in the event of a pandemic? Will the transformation exacerbate a pandemic? Also, think about impact of digital transformation on ecosystem. Note: e-health is lingual functioning with a biotic target.

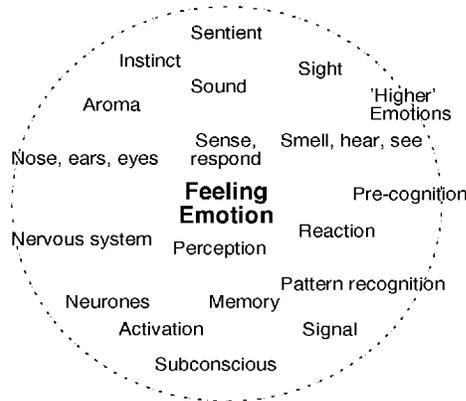


Summary: "<http://dooy.info/aspects.smy.html#bio>"  
 Fuller: "<http://dooy.info/biotic.html>"

### The Psychic / Sensitive Aspect

Kernel: Feeling, emotion. Experienced as: Sensing and feeling (such that animals have, like fear, hunger). Recognising, remembering, responding. Colour, sound, etc. Good: Interactive engagement with the world; Dysfunction: Insensitivity.

Example: Will the digital transformation work for those who are visually or aurally impaired, or with dementia?



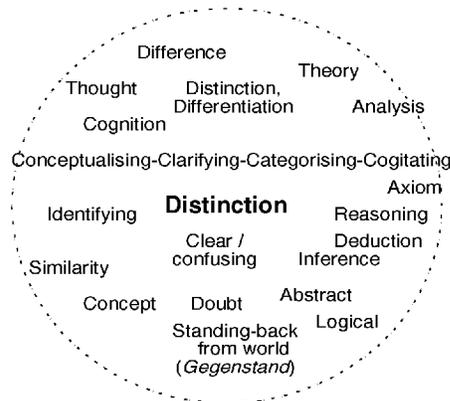
Summary: "<http://dooy.info/aspects.smy.html#psy>"

Fuller: "<http://dooy.info/sensitive.html>"

### The Analytical Aspect

Kernel: Distinction: "Setting apart what is given together" [NC,I, 39].  
 Experienced as: Conceptualising, clarifying, categorising and cogitating.  
 Conceptualising is of something meaningful in the world. We clarify that meaning, separating 'this' from 'that'. Categorising differentiates ways of being meaningful. Cogitating is thinking that involves these. Good: thinking independently of the world as given, imagination; dysfunction: conflation-confusion (and in other aspects aloofness etc.).

Example: Clarity about goals for the transformation. Clearly defined data in its implementation.



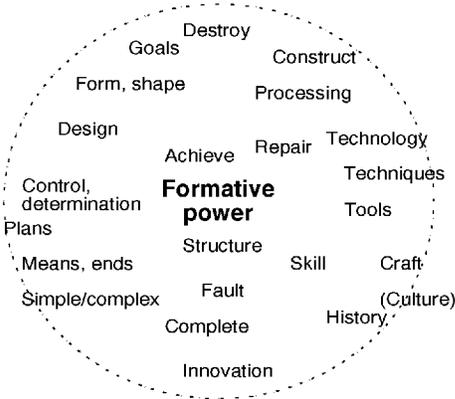
Summary: "<http://dooy.info/aspects.smy.html#anl>"

Fuller: "<http://dooy.info/analytical.html>"

### The Formative Aspect

Kernel: Formative power. Experienced as: Shaping, making, planning, structuring, achieving; innovation; goals, techniques, tools, technology. All kinds of things can be shaped: clay into pots, concepts into concept-structures, reasons into arguments, words into sentences, people into performers, social relationships into institutions, etc. - see "target aspects" in Section 3. Historical impact is formative. Good: Achievement; Dysfunction: Laziness or destruction. Through technology, technique and training, good in any targeted aspect can be amplified. So can evil.

Example: Purpose(s) of the transformation; plans for achieving them; to what extent they are achieved. Technologies, tools, techniques involved. Data structures and algorithms in the software. Development of the system (software, hardware, and also of the organisational structures in which the system will operate). What it enables or hinders in the life or work activities of those affected. (These seemingly disparate ways in which the formative aspect is relevant to digital transformation are drawn from examples in Section 5.)

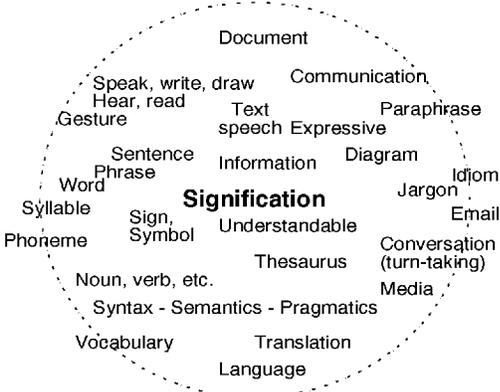


Summary: "<http://dooy.info/aspects.smy.html#fmv>"  
 Fuller: "<http://dooy.info/formative.html>"

**The Lingual Aspect**

Kernel: Symbolic signification. Experienced as: Expressing, recording and reading/hearing. This can be by speech, writing, pictures, gestures, and even such things as boundary stones - signs, symbols, language, data, etc. Good: Externalisation of clearly intended (target) meanings, so they can be communicated with good understanding; Dysfunction: Deceit, also dyslexia, etc.

Example: "Digital" implies a system based on information in the form of data and its processing, in which the lingual aspect is of primary importance. So understanding, transparency, explanation, etc. are important. Information to users: is it understandable? (Jargon? Idioms?) Each kind of digital system has different target aspect (see Section 3); e.g. e-health is lingual functioning targeting the biotic aspect.

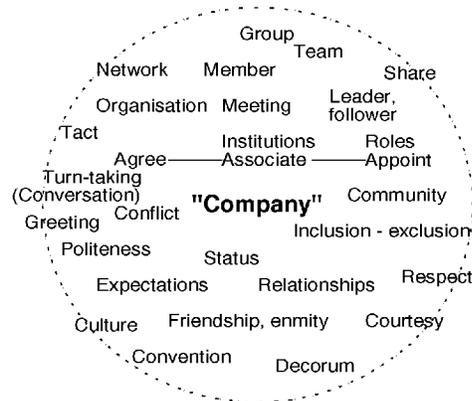


Summary: "<http://dooy.info/aspects.smy.html#lng>"  
 Fuller: "<http://dooy.info/lingual.html>"

## The Social Aspect

Kernel: "Social intercourse" [Dooyeweerd], "company" [Stafleu 2005]. Experienced as: We, us and them; agreeing, associating and appointing. Agreeing implies shared action, belief, assumptions, etc. Associating implies treating others as like myself and submerging (though not obliterating) the I in the we. Association is either relationships or institutions, and implies roles (reader-writer, leader-follower, etc.), hence "appointing". Good: Friendship, communities, organising ("better together"); Dysfunction: Aloofness, disrespect, rudeness, enmity.

Example: Roles around the transformation; who are the stakeholders? What impact does it have on these? Agreement on what the transformation is, whether it is good and in what ways it is meaningful. Idioms and cultural knowledge in the information the system gives to, or expects from, users. What impact does the transformation have on relationships?



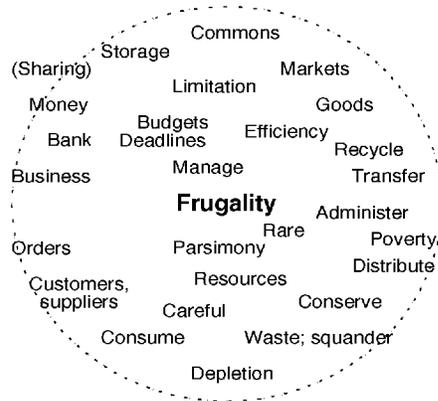
Summary: "<http://dooy.info/aspects.smy.html#soc>"

Fuller: "<http://dooy.info/social.html>"

## The Economic Aspect

Kernel: Frugality. Experienced as: Managing limited resources efficiently, treating them as having value. Economic functioning is "the sparing or frugal mode of administering scarce goods, implying an alternative choice of their destination with regard to the satisfaction of different human needs" [NC,II, 66]. This can be at level of individuals, organisations, societies and humanity as a whole. Resources can be of any type (target aspect; see Section 3). Good: Sustainable Shalom (prosperity); Dysfunction: Waste, unsustainability, destitution.

Example: Too obviously, the costs of developing and running digital transformation. More important: resources of skills, time during development, and user patience when running. Impact on world resources, especially indirect and hidden.



Summary: "<http://dooy.info/aspects.smy.html#eco>"

Fuller: "<http://dooy.info/economic.html>"

## The Aesthetic Aspect

Kernel: Harmony, delight. Experienced as: holism, orchestration, integration; rest, leisure, comfort, style; enjoying, playing, beautifying, humour and fun. Surprise, originality are aesthetic. "Whole is more than sum of parts." The orchestra of daily life, a multitude of instruments, generates something harmonious, interesting and enjoyable -- or not as the case may be. Good: Harmony and integration, enjoyment; Dysfunction: Tedium, repulsiveness, pretension, fragmentation, snobbery.

Example: The harmony of the digital system (including technical and data interoperability). Harmony of the system within its (global or national) context - historical, social, juridical, attitudinal and religious. How well does it fit into user's lives and work (comfortably) rather than disrupt them.

(Question to ponder: Transformation involves some 'disruption'. But is it often the case that academics and managers believe that 'the others' need to be disrupted? Is there arrogance there? Is it not the case that the best transformations retain some level of aesthetic comfort of life but change people's attitudes and beliefs - the ethical and pistic aspects?)



Summary: "<http://dooy.info/aspects.smy.html#aes>"

Fuller: "<http://dooy.info/aesthetic.html>"

## The Juridical Aspect

Kernel: Due. Experienced as: Appropriateness, (legal) proportionality, responsibility (and rights), justice, (un)fairness, oppression or emancipation; rewarding or punishing (“retribution” [NC,II, 129]). Debt is juridical and often economic too. Good: Justice, appropriateness; Dysfunction: Partiality, inappropriateness, disproportion; injustice, oppression.

Example: Laws of states where transformation occurs. Natural justice. During development: not cutting corners in design, coding or testing. No ‘cheat devices’ (as in Volkswagen 2015). Due to all stakeholders - including the planet long-term.



Summary: “<http://dooy.info/aspects.smy.html#jur>”

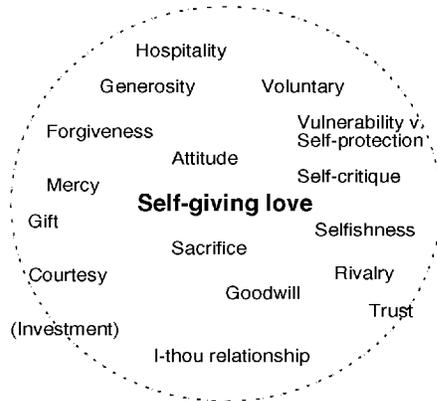
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## The Ethical Aspect

Kernel: Self-giving Love. Experienced as: Goodness in its richest sense, involving attitude of self-giving generosity, openness (vulnerability), trust, willing sacrifice. Good: Permeates reality with extra goodness, beyond the imperative of due; Dysfunction: Not hatred so much as selfishness, self-protection, advantage-taking, competitiveness, uncaringness, and so on.

Note: Generosity in the hope of gaining reputation or any payback is no real generosity. “When you give to the needy, do not announce it ...” [Matthew 6:2]

Example: How generous is the transformation; is it intended to bring real good to others, or only to the technical suppliers, to senior management or politicians? The best and longest-lasting transformations were motivated by love of others rather than of self - c.f. Quaker Capitalism (see e.g. “<http://dooy.info/examples/quaker.capitalism.html>”). Does the transformation make people more selfish or more self-giving (e.g. Facebook)?



Summary: "<http://dooy.info/aspects.smy.html#eth>"  
 Fuller: "<http://dooy.info/ethical.html>"

### The Pistic / Faith Aspect

Kernel: Faith, commitment. Experienced as: Belief, commitment, certainty, motivation, courage, ultimate meaningfulness, hope, morale. Pistic ranges from that "immediate certainty which manifests itself ... in practical life" [NC,II, 299] by which we live moment by moment (e.g. assuming chair will hold my weight), to firm ideological or religious belief for which people give their lives. Good: Courage, motivation, loyalty, hope, meaningfulness; dysfunction: Pride, hubris, narcissism (partly ethical), cowardice, disloyalty, despair, idolatry, meaninglessness.

Example: Transformation needs courage (but remember ethical aspect above). What kind of belief is there in, and commitment to, the transformation - not only by project instigators but by all those affected? Is it idolatrous or valid belief? c.f. Krishnan-Harihara & Basden [2009] about e-government failure because of idolatry.



Summary: "<http://dooy.info/aspects.smy.html#pis>"  
 Fuller: "<http://dooy.info/pistic.html>"

### 3. Some Notes On Aspects - Some Useful Concepts

1. Dooyeweerd warned that no such suite of aspects should ever be taken as any final truth [Dooyeweerd 1955,II, 556]. It is always merely a **provisional** best guess.

2. The kernel meaningfulness of each aspect is better grasped by **intuition** than by theoretical thought, and can never be fully captured in definitions, but only 'triangulated' as above.
3. Most fundamentally, each aspect is a **sphere of meaningfulness** within which we "dwell" [Polany & Prosch 1975]. See "<http://dooy.info/meaning.html>".
4. As such, each aspect enables a different mode or **kind of being**. Most things exist in multiple modes, but are qualified or led by a single aspect. e.g. pebble (physical), purple (sensitive), paragraph (lingual), poem (aesthetic).
5. Each aspect offers a different **rationality**, a different way of making sense. See "<http://dooy.info/rationality.html>".
6. The meaningfulness of each aspect implied a different kind of **value or good**. From the biotic onwards, we may distinguish good from evil (bad, dysfunction), positive from negative.

Example: Juridical good is justice, evil is injustice.

Note: These positives and negatives in each aspect are not socially constructed norms or rules, but are deeper norms or values that contribute to broader **success or failure** when looked at holistically. Success may be seen as resulting from our functioning well in all aspects; failure results from dysfunction in at least one aspect. Aspectual norms operate whether or not people are aware of them. The positive and negative repercussions of later aspects tend to emerge over the longer term. (However, our *knowledge* of the positives and negatives in each aspect are socially constructed.)

7. Each aspect is also a **sphere of law** (deeper than social norms or state laws) in which enables and guides functioning. Each aspect offers a different kind of possibility. See "<http://dooy.info/law.html>".
8. **Functioning** in an aspect usually has repercussions, which feel like a different kind of causality in each aspect. Functioning and repercussions can be good or bad; see above.
9. **Inter-aspect dependency**. The functioning of one aspect depends on that of others. Example: full social functioning depends on good lingual functioning, which depends on good formative and analytical functioning, etc.
10. **Target aspects**. Most aspectual functioning in one aspect targets other aspects. e.g. Saying "this rose is red" is lingual functioning that targets the sensitive aspect of colour.
11. **Multi-aspectual functioning**. Most activity involves multiple aspects working in coherence, involving dependency, targeting, etc. Human activity involves all aspects. As above, usually there is one aspect that most gives the activity its main meaningfulness - a "qualifying" aspect.

For example, in writing this, my qualifying aspect is the lingual, but I am also functioning in the formative aspect of structuring what I write, the analytic aspect of selecting ideas to write from those to ignore, the psychical aspect of pressing keys, the social aspect of trying to make this friendly, the economic aspect of not wasting words, the aesthetic of ensuring it hangs together, the juridical of giving what is appropriate, the ethical of going beyond what is due, the biotic of believing what I write, as well as the biotic of being

alive, physical of force on keys, kinematic of finger movement, spatial of being near keyboard, and quantitative aspect of being one person. (Notice, for below, how I went through all aspects but not in one linear order.)

## 4. Analysis Using Dooyeweerd's Aspects

Dooyeweerd's aspects offer an extremely useful tool for many kinds of analysis; Chapter 11 of Basden [2020] discusses several of these.

In this workshop, two of the simpler techniques are introduced for analysing situations of digital transformation. Participants are invited to practise either or both of them as part of the workshop.

- » Going through all aspects in turn to uncover a wide range of issues;
- » Going through issues to decide which aspects make them meaningful.

Either method can help ensure that a wide range of issues is considered, including many hidden issues.

### 4.1 Common to Both Methods

# Typically, both methods might be carried out by a facilitator interviewing those involved in the situations and those with relevant expertise might be interviewed. Also issues might also come from written material.

In this workshop, participants might act as both facilitator and interviewee, 'interviewing' themselves and guiding themselves as suggested below. That is particularly useful for online participation.

# It is most useful if the interviewee is given a brief, ten-minute explanation of the kernel meanings of the aspects, suited to intuitive understanding. This puts the interviewee in control as they think about what is meaningful to them about the topic.

Participants in the workshop have already been given this in Section 2 above.

### 4.2 Analysis by Going Through Aspects in Turn

This method was pioneered by Kane [2006] in her *Multi-aspectual Interview Technique* (MAIT), described briefly in §11-6.3 of Basden [2020].

# After introducing the interviewee to the aspects, invite them to look at each aspect in turn, in any order they wish. Assure them that they can take the aspects in any order, and can return to aspects they have already covered if they wish.

In the workshop on digital transformation, participants might like to choose an example of digital transformation of which they are aware, or else think about it more generally. Then ask themselves which are some main aspects they wish to consider first. Consider these first, then move to other aspects.

# For each aspect in turn, ask "Which issues of digital transformation (or any other topic) are meaningful in this aspect?"

Example: The following issues might be meaningful in the formative aspect: which technology is used; the purpose of the digital transformation, and of each technical component thereof; what each part is meant to achieve in the lives of people; what each does actually achieve; impact on the formative functioning of people (enabling or hindering achievements); impact on these for society as a whole; planning the project of implementation; the cognitive effort needed to use the system ...

# That seems complex and indeed it can be, but this depth is not expected in the practice sessions in this workshop. Section 5 suggests how that complex of issues may be made sense of.

# It is useful to link issues together by various relationships, such as what causes what.

# The order in which aspects are traversed can be quantitative to pistic, or pistic to quantitative, or any other order - as long as every aspect is given its chance to 'speak' to us.

In explaining the aspects in Section 2, I suggested a few issues meaningful in each aspect from quantitative to pistic.

In the example of multi-aspectual functioning in Section 3, I began with what I thought was the qualifying aspect, then thought about some of the earlier aspects on which it depends, then proceeded to the later aspects until the pistic, then went to the early aspects.

# It is likely that the interviewee will seem to misinterpret aspects sometimes. This does not always matter. What matters initially is that they are enabled to separate out issues into different basic kinds and Dooyeweerd's aspects help them do this.

# It is wise for the facilitator to keep a mental note of which aspects have been covered. Once the interviewee is nearing the end ('saturation'), ask them if they wish to consider any aspect not yet discussed.

# At the end, it is wise to ask if the interviewee has any other issues that they do not wish to assign to aspects.

### **4.3 Analysing Which Aspects Make Issues Meaningful**

This method was pioneered by Winfield [2000] as a *Multi-aspectual Knowledge Elicitation* (MAKE), described briefly in §11-6.2 in Basden [2020]. Also see Winfield et al. [1996].

# How might issues arise? From open interviewing. Or gathered from literature about the topic of interest. Or, as Winfield found it useful to do, 'kick the process off' by asking the interviewee to name a couple of aspects that were most meaningful (e.g. biotic and economic for veterinary practice), and then to bring out issues that are meaningful in those aspects. From this starting-point, he then relied on the interviewees' mental maps.

In the workshop, it might be useful to take Winfield's approach and ask for a couple of starting-aspects.

# For each issue that arises, ask which aspect(s) makes it meaningful. Many issues involve at least two aspects if not more, but is there a main aspect?

# Questions like “Can you say more about that?” or “Why is that so?” or “When might that not be so?” or “What do you mean by that?” can stimulate the interviewee to think of many more issues (for which aspects will be identified).

# Winfield found it useful to plot the issues on a large piece of paper. He would arrange the issues around their main aspect.

# Ask how the issues relate to each other. Winfield drew links on the paper. They might link issues in different aspects.

# Keep cycling round the above, until few new issues are emerging (‘saturation’).

# When the interviewee begins to ‘saturate’, i.e. no new issues are emerging, then ask, “Are there any aspects not yet covered? Would you like to consider one of those?” Return to the cycle above with any issues that emerge.

# At the end, it is wise to ask whether there are any issues that do not seem to fit any aspect.

# As above, it is likely that the interviewee will seem to misinterpret aspects sometimes. This does not always matter. What matters initially is that they are enabled to separate out issues into different basic kinds and Dooyeweerd’s aspects help them do this.

#### **4.4 Comparison of the Two Methods**

See §11-6.4 and §11-6.5 of Basden [2020] for practical and philosophical reflections on MAKE and MAIT. The following are drawn from those sections.

# Asking which aspects make an issue meaningful is appropriate for those who are used to conceptual thinking, but less so for those not used to conceptual thinking. Going through aspects one by one is useful for both.

# Both Winfield and Kane found that all interviewees would find issues in almost every aspect without much difficulty.

# Both methods are good at uncovering hidden knowledge. Kane found the aspect-by-aspect approach was particularly helpful when an interviewee felt that certain kinds of issues were either too trivial to mention or were embarrassing.

# One might think that using these fifteen aspects might constrain. In fact, most interviewees found it freed them. This is probably because, usually, people consider only a few aspects and being invited to consider others widens their thinking horizons.

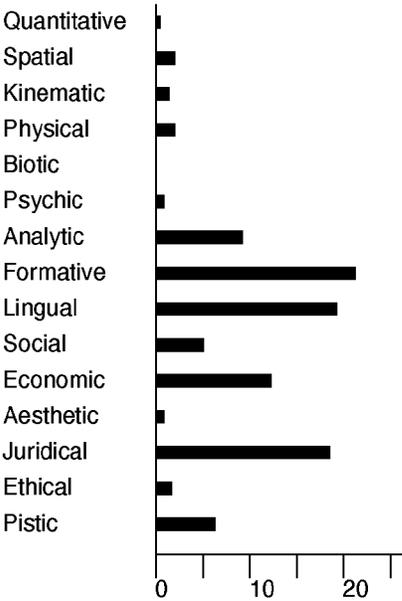
#### **4.5 What To Do With The Aspectual Issues**

Both methods yield a host of ‘aspectual issues’ (issues for which aspects have been identified). Several things can be done with this.

# Understanding a topic. Uncovering issues in every aspect can enhance our holistic understanding of that topic. Especially if we can relate the aspectual issues to each other.

# Assessment of bias. Count the number of issues meaningful in each aspect (issues meaningful in two aspects can be counted under both).

See which aspects have been found meaningful much more than others. This might point to some bias. Plotting a barchart might be useful:



< CE Figure. Aspectual profile: Relative importance of each aspect (%) to those involved with healthcare records (from Khojah [2018]).

# Direction for further analysis. Identify aspects that have been mentioned only a few times. Are these aspects taken for granted? Or are they 'out of fashion'? Either way, investigate the meaningfulness of these aspects.

# Assessment of failure and success. Every aspect from the biotic onwards is normative, in defining different kinds of good and evil, positive and negative, what to aspire to and what to avoid. Separating positive from negative can reveal where there are problems (e.g. possible hidden reasons for failure) and where there are strengths.

Especially useful for clarifying reasons for failure of digital transformation (c.f. Joneidy's cases presented) without ignoring successful aspects.

# Guidance for future. Ask how, in general, does the positive norm of each aspect guide us? Then ask which of these have been mentioned and which have been not mentioned - maybe taken for granted. Look at the negatives found for various aspects and ask how they might be overcome. Think about inter-aspect dependency.

**5. Deeper Aspectual Analyses**

This is for those who wish to take aspectual analysis further. It might not occur during the workshop.

With the two methods above, aspectual issues have been collected. If you feel some heterogeneity in the collection, you would be correct. This is because aspects are relevant in several ways. The two lists, above, of issues meaningful in the formative aspect gives examples of this.

This section outlines about a dozen ways in which aspects might be relevant to digital transformation, and the issues meaningful in the formative aspect, from the two lists above, are used as examples. They are taken from Chapters 5 to 9 of Basden [2018], which is about five major areas of concern about information systems. Read those chapters for discussion of each.

# The development of the digital transformation system involves at least four major responsibilities that the development teams must shoulder. Each of which involves every aspect (Chapter 9):

- » Creation of the technological artefacts and system (specification, design, coding, testing, documentation). Formative examples: Which technology used; data structures and algorithms.
- » Eliciting knowledge of the relevant domains, in order that the technological system will be accurate and complete, reducing errors when in use. Formative example: Arranging the information elicited.
- » Anticipating use - who are its main users (not only now but in the future, and other stakeholders), how will they use it, what benefits will it bring, what problems are likely, what other wider impact might there be? What is its context of use? Formative example: User-relevant tasks intended to be carried out by each technical component, and what are the benefits of doing each.
- » Orchestrating the project ("project management"). Formative example: Overall purpose of the transformation; Planning the project; Overall choice of technology.

# Design of the System and each of its components and features, especially of the user interface (Chapter 7)

- » Affordance: What benefit does the system afford each. Formative example: Achieving those benefits.
- » Appropriateness: Are the user interface features appropriate to the kind of information being handled? Formative example: Are data structures and algorithms fit for purpose?

# Use of the system (and each of its components) involves three multi-aspectual human engagements (Chapter 6)

- » Engaging with the technology and the user interface. Formative example: Cognitive effort needed to use the system.
- » Engaging with meaningful content. Formative example: Is this content properly structured to enable users to engage with it as intended?
- » Engaging in life with the system. Formative example: What does the system enable or hinder the user in achieving? What is each component meant to achieve, and what does it actually achieve? Similarly for more distant stakeholders.

# Relationship with Society (Chapter 8)

- » Widespread use and amplified impact (e.g. a million users of it). Formative example: What changes does it make to society?
- » The system as infrastructure that constrains or enables certain ways of living or working, and precludes others. Formative example: The

digital transformation as part of the technological infrastructure of society or organisation.

- » Attitudes in society: idolatry of technology. See Krishnan-Harihara & Basden [2009].
- » Ideas about progress. Formative example: Progress is humanity's functioning in the formative aspect overall.

# Philosophical Issues (Chapter 5)

- » What is transformation? See pistic and ethical aspects.

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